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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/828,596

04/21/2004

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5649-1286

5520

20792 7590 07/14/2009
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EXAMINER

NADAV, ORI

ART UNIT

PAPER NUMBER

2811

MAIL DATE

DELIVERY MODE

07/14/2009

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1, 4-6 and 11-15 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The claimed limitations of “forming a metal oxide dielectric film on the oxygen-deficient metal oxide film by ALD using a lanthanum containing compound and an oxidizing agent to form the thin dielectric film comprising the oxygen-deficient metal oxide dielectric film and the metal oxide dielectric film”, as recited in amended claim 1, are unclear as to which element comprises the oxygen-deficient metal oxide dielectric film and the metal oxide dielectric film, since the thin dielectric film belongs to the passage “forming a metal oxide dielectric film on the oxygen-deficient metal oxide film by ALD using a lanthanum containing compound and an oxidizing agent to form the thin dielectric film”.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 4-6 and 11-15, as best understood, are rejected under 35 U.S.C.

103(a) as being unpatentable over Lim et al. (2003/0040196) in view of Stamm et al. (2001/0040905).

Lim et al. teach in figure 5C and related text a method of forming a thin dielectric film, comprising:

forming an oxygen-deficient metal oxide dielectric film 33 comprising La_2O_3 , on a semiconductor substrate by atomic layer deposition (ALD, paragraph [0020]) using a lanthanum containing compound (paragraph [0067]); and

forming a metal oxide dielectric film 34 on the oxygen-deficient metal oxide film by ALD using a lanthanum containing compound and an oxidizing agent to form the thin dielectric film comprising the oxygen-deficient metal oxide dielectric film and the metal oxide dielectric film.

Lim et al. do not teach forming an oxygen-deficient metal oxide film comprising La_2O_x wherein $0 < x < 3$.

Stamm et al. teach that layer 104 comprises an oxygen-deficient metal oxide film comprising La_2O_x wherein $0 < x < 3$.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to form an oxygen-deficient metal oxide film comprising La_2O_x wherein $0 < x < 3$ in Lim et al.'s device in order to use the device in a light detection application such as CCD camera and PSD.

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Regarding claims 5, 12-13 and 15, Lim et al. teach:

(a) feeding the lanthanum containing compound onto the semiconductor substrate to form an adsorbed layer of the lanthanum containing compound;

(b) removing a byproduct of (a) by means of purge; and

(c) optionally repeating (a) and (b) until the oxygen-deficient metal oxide film with a predetermined thickness is formed, and

annealing the oxygen-deficient metal oxide film, wherein the annealing is carried out after forming the oxygen-deficient metal oxide film or after forming the metal oxide film,

wherein the annealing is carried out under an atmosphere of a gas selected from the group consisting of O₂, N₂, and O₃, or combinations thereof, or under a vacuum atmosphere.

Regarding claims 4, 6, 11 and 14, Lim et al., do not explicitly state that the first reactant is selected from the group consisting of various tris or combinations thereof, the oxygen-deficient metal oxide film has a thickness in a range of about 5Å to about 30Å, wherein the method is carried out at a temperature in a range of about 200°C to about 350°C, and wherein the annealing is carried out at a temperature in a range of about 300°C to about 800°C.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use a first reactant selected from the group consisting of various tris or combinations thereof, the oxygen-deficient metal oxide film has a thickness in a

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range of about 5A to about 30A, wherein the method is carried out at a temperature in a range of about 200°C to about 350°C, and wherein the annealing is carried out at a temperature in a range of about 300°C to about 800°C in prior art's device in order to form the device, as taught by prior art, using conventional processing temperatures, thicknesses and materials.

Response to Arguments

Applicant argues that Stamm et al. do not teach an oxygen-deficient metal oxide dielectric film comprising La_2O_3 , because Stamm et al. teach a frequency converting coating 104 being $\text{La}_2\text{O}_3\text{S:Eu}$, which is different and distinct from the La_2O_3 recited in Claim 1 of the present application.

Claim 1 recites "forming an oxygen-deficient metal oxide dielectric film comprising La_2O_3 ". Claim 1 does not recite forming an oxygen-deficient metal oxide dielectric film 33 **consisting of** La_2O_3 . The phrase "comprising La_2O_3 " allows additional elements to be included in the compound La_2O_3 . Therefore, the compound $\text{La}_2\text{O}_3\text{S}$ comprises La_2O_3 , as claimed. Note that although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Applicant argues that an artisan would not be motivated to utilize the frequency converting coating 104 of Stamm et al. instead of the insulating layer of Lim et al.

The new rejection states that an artisan would utilize the frequency converting coating 104 of Stamm et al. in Lim et al.'s device, not instead of an insulating layer, but as an addition to the device, when using Lim et al.'s device in an application which requires a frequency converting coating material.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ori Nadav whose telephone number is 571-272-1660. The examiner can normally be reached between the hours of 7 AM to 4 PM (Eastern Standard Time) Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lynne Gurley can be reached on 571-272-1670. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

O.N.
7/13/2009

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